Seyventh Semester B.Tech Degree Examination, November 2016
(2013 Scheme)
13.705.8 ADVANCED COMPUTATIONAL METHODS (C) (Elective II)

Time : 3 Hours
Max Marks :100

Instructions: Answer all questions in Part A and any one question from each module in Part B

PART-A

1. Discuss different types of errors associated with numerical methods
2. What do you mean by multiple regression analysis?
3. Explain Hermite’s interpolation
5. What are partial differential equations? How are they classified? 5x4 = 20 Marks

PART-B

Module I

6. Solve by Gauss Elimination method:
   \[ \begin{align*}
   x_1 + 2x_2 + 5x_3 + x_4 &= -8 \\
   -x_1 + 7x_2 + 2x_3 + 4x_4 &= 15 \\
   x_1 + x_4 &= 3 \\
   4x_1 + x_2 - x_3 + x_4 &= 11
   \end{align*} \]

20 Marks

OR

7. Find the largest eigen value and eigen vector for the given matrix. Adopt ‘Power Method’
   \[
   \begin{pmatrix}
   2 & 1 & 1 & 0 \\
   1 & 1 & 0 & 1 \\
   1 & 0 & 1 & 1 \\
   0 & 1 & 1 & 2
   \end{pmatrix}
   \]
   20 Marks

Module II

8. A simply supported beam carries concentrated load \( P \) at its midpoint. Corresponding to various values of \( P \) the maximum deflection \( Y \) is measured and the data are given below:
   \[ \begin{align*}
   P : 100 & & 120 & & 140 & & 160 & & 180 & & 200 \\
   Y : 0.45 & & 0.55 & & 0.60 & & 0.70 & & 0.80 & & 0.85
   \end{align*} \]
   Find the equation of the form \( Y = a + bP \) 20 Marks
9. Obtain the cubic spline approximation of the given data, hence determine 
y(0.5) and y'(2)
\[
\begin{array}{c|c|c|c|c|}
X & 0 & 1 & 2 & 3 \\
Y & -5 & -4 & 3 & 6 \\
\end{array}
\]

\(20\) Marks

Module III

10. Find y(0.1), y(0.2) given \(dy/dx = x - 2y,\) \(y(0)=1\) taking \(h=0.1\) using 4\(^{th}\) order
Runge-Kutta method.

\(20\) Marks

OR

11. Solve the boundary value problem:
\[
x \frac{d^2 y}{dx^2} + y = 0, y(1) = 1, y(2) = 2, \quad \text{Take } h = 1/4.
\]

\(20\) Marks

Module IV

12. Solve the equation \(u_{xx} + u_{yy} = 0\) for the square mesh with boundary value as shown in figure.

\(20\) Marks

OR

13. Find the values of \(u(x,t)\) satisfying the parabolic equation \(u_t = 4u_{xx}\) under the conditions \(u(0,t) = u(8,t)=0\) and \(u(x,0) = 4x - x^2/2\) at the points \(x=i: i = 0,1,2,\ldots,7\) and \(t=j/8: j = 0, 1, 2,\ldots,5.\)

\(20\) Marks